

REMARKS

Claims 1, 13-24, and 26-30 are pending in the application following entry of the above amendments. Claims 2-12, and 25 have been canceled. Claims 29 and 30 have been added. No new matter has been added.

The applicants acknowledge the determination by the Examiner that claims 3 and 17-18 were allowable but objected to as depending on a rejected claim. The limitations of claim 3, now canceled, have been added to independent claim 1. Claims 17 and 18 have been rewritten in independent form.

ARGUMENTS

Claims 14 and 16 are rejected as indefinite. Claim 14 has been amended to refer to "resistor flow path" instead of "resistor structure" for antecedent basis. Claim 16 has been amended as suggested by the Examiner to include the word "comprise".

Claims 1, 2, 4-11, 13 and 14 have been rejected as anticipated by U.S. Pat. No. 6,387,052 (Quinn). Claim 1 has been amended to include the features of claim 3, now canceled. In view of the acknowledged patentability of claim 3, it is believed that claim 1 should be allowed. Claims 2 and 4-11 have been canceled. Claims 13 and 14 depend from claim 1 and, therefore, should be allowed for the same reasons as claim 1.

For the foregoing reasons, it is respectfully requested that the rejection of claims 1 and 13-14 based on Quinn be withdrawn.

Claims 1 and 26-28 are rejected as anticipated by U.S. Pat. No. 5,065,526 (Khali). Again, claim 1 has been amended to include the features of claim 3. Claim 1 as amended, therefore, should be allowed. Claims 26-28 depend from claim 1 and, therefore, should be allowed for the same reasons as claim 1.

For the foregoing reasons, it is respectfully requested that the rejection of claims 1 and 26-28 based on Khali be withdrawn.

Claims 19-22 and 24 are rejected as anticipated by U.S. Pat. No. 5,727,553 (Saad). As discussed above, claim 1 has been amended to include the features of claim 3 and, therefore, should be allowed. Each of claims 19-22 and 24, as amended, depends from claim 1 and should also be allowed for the same reasons as claim 1.

For the foregoing reasons, it is respectfully requested that the rejection of claims 19-22 and 24 based on Saad be withdrawn.

Claims 15 and 16 are rejected as obvious based on Quinn and U.S. Pat. No. 5,682,899 (Nashef). Again, claim 1 has been amended to include the features of claim 3 and, therefore, patentably distinguish claim 1 over the prior art. Claims 15 and 16, which depend from claim 1, also patentably distinguish over the prior art for the same reasons as claim 1 and should, therefore, be allowed. For the foregoing reasons, it is respectfully requested that the rejection of claims 15 and 16 based on Quinn and Nashef be withdrawn.

Claim 23 is rejected as obvious based on Saad. Claim 23 depends from claim 1 and, therefore, patentably distinguishes over the prior art for the same reasons as claim 1, discussed above. Withdrawal of the rejection of claim 23 based on Saad is requested.

Claims 25-26 are rejected as obvious based on Quinn and Saad. Claim 25 has been canceled. Claim 26 depends from claim 1. Therefore, for the same reasons discussed above for claim 1, claim 25 patentably distinguishes over the prior art. Withdrawal of the rejection of claim 26 based on Quinn and Saad is requested.

New claims 29 and 30 have been added. As indicated on page 1 of the description of the application, the present application is concerned with heat transfer devices as disclosed in US 5,509,424, the disclosure of which is incorporated into the present application by reference.

Claim 29 depends from claim 1, discussed above, and, therefore, should be allowed for the same reasons as claim 1.

The catheter of new claim 30 includes a temperature sensing element to measure the ambient blood temperature. Unlike the temperature detecting means disclosed in Quinn and Khalil, this temperature sensing element measures ambient blood temperature, not the

temperature of blood following its heating by a heating filament or coil. The catheter of the present invention measures cardiac output (volumetric flow of the blood) by the temperature difference produced by subtracting the average ambient blood temperature (detected by a temperature sensing element) from the temperature of the heat transfer device (detected by the temperature sensor at the heat transfer device), wherein the heat transfer device is cooled by the flow of blood which is in thermal contact with the heat transfer device.

Unlike the catheters of the documents cited by the Examiner, the catheter of the present invention does not utilize thermodilution to determine cardiac output. Both Quinn and Khalil, cited by the Examiner, disclose catheters provided with a heating filament (Quinn) or heater coil (Khalil) respectively to apply heat to the blood for use in the measurement of cardiac output by a thermodilution method. In a thermodilution method, heat is applied to the blood and then the downstream temperature variations of the blood are measured. In the cited documents, the increase in temperature of the blood is dependent on the velocity of the blood, thus the faster the flow of the blood, the less the increase in temperature effected to the blood by the heating devices of Quinn and Khalil.

The heat transfer device of the catheter of the present application is not merely a heater. In contrast to the heaters of the cited documents, the heat transfer device of the catheter of the present application determines the heat loss experienced by the heat transfer device due to the cooling action of the blood in thermal contact with the device. The amount of heat loss from the heat transfer device is measured by determining the amount of energy required to be supplied to the heat transfer device to maintain the heat transfer device at a predetermined temperature. To determine the temperature at which the heat transfer device is to be maintained, knowledge of the ambient blood temperature is used.

As the catheters of Quinn and Khalil do not comprise the heat transfer device or the temperature sensing element to measure the ambient temperature of the blood as required by claim 30, the catheters disclosed by these documents do not disclose all of the features of that claim. Claim 30 is, therefore, believed to be novel.

Moreover, as the catheters of Quinn or Khalil teach that cardiac flow may be determined successfully using thermodilution without any need whatsoever for a temperature sensing element to measure the ambient temperature of the blood, neither document provides any motivation to the skilled person to modify the catheters disclosed in those documents to include such a feature. Assuming that the skilled person would consider modifying the catheters disclosed, which for the reasons given above is not admitted, the present invention would not result. Thus, the catheter as claimed by claim 30 would not be obvious in view of the catheters disclosed by the cited documents.

It is respectfully submitted that the application is in condition for allowance. A Notice of Allowance is solicited. If the Examiner believes, however, that direct communication would advance prosecution, the Examiner is invited to telephone the undersigned.

Respectfully submitted,

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